CLAIMS

1. A method of fabricating an electronic device formed on a semiconductor wafer, comprising the steps of:

forming a layer of a first material in a fixed position relative to the wafer, wherein the first material has a dielectric constant less than 3.6;

forming a photoresist layer in a fixed position relative to the layer of the first material;

forming at least one void through the layer of the first material in response to the photoresist layer; and

subjecting the semiconductor wafer to a plasma which incorporates a gas which includes hydrogen so as to remove the photoresist layer.

2. The method of claim 1:

wherein the step of forming at least one void further forms a polymeric residue in response to the photoresist layer; and

further comprising the step of removing the polymeric residue.

3. The method of claim 2 wherein the step of removing the polymeric residue comprises subjecting the semiconductor wafer to a wet etch chemistry.

4. The method of claim 3 and further comprising the step of subjecting the semiconductor wafer to an annealing step to remove any excess fluid from action of the wet etch chemistry on the semiconductor wafer.

5. The method of claim 4 wherein the annealing step comprises subjecting the semiconductor wafer to a plasma which incorporates a mixture of hydrogen and nitrogen.

6. The method of claim 5 wherein the mixture includes no more than 40% nitrogen.

7. The method of claim 2 wherein the step of removing the polymeric residue comprises subjecting the semiconductor wafer to a combination of dilute hydrofluoric acid and an organic acid.

8. The method of claim 7 wherein the organic acid comprises dilute citric acid.

9. The method of claim 8 wherein the dilute citric acid is diluted with deionized water at a ratio between 1:50 to 1:250.

10. The method of claim 7 wherein the organic acid comprises dilute acetic acid.

11. The method of claim 8 wherein the dilute acetic acid is diluted with deionized water at a ratio on the order of 1:200.

12. The method of claim 7 wherein the organic acid comprises oxalic acid.

13. The method of claim 7 wherein the dilute hydrofluoric acid is diluted with deionized water at a ratio between 1:500 to 1:1,000.

14. The method of claim 2 wherein the step of removing the polymeric residue comprises subjecting the semiconductor wafer to a dry plasma.

15. The method of claim 2 wherein the step of removing the polymeric residue comprises subjecting the semiconductor wafer to a mixture of hydrogen, oxygen, and fluorine.

16. The method of claim 15:

wherein the hydrogen in the mixture is provided from a hydrogen source selected from a group consisting of H_2, NH_3, N_2H_2, H_2S, and CH_4; and

wherein the fluorine in the mixture is provided from a fluorine source selected from a group consisting of CF_4, C_2F_6, CHF_3, CH_2F_2, SF_6, CH_3F, and NF_3.

17. The method of claim 15 wherein the mixture further comprises an inert gas.

18. The method of claim 17 wherein the inert gas is selected from a group consisting of nitrogen, argon, xenon, helium, and neon.

19. The method of claim 2 wherein the step of removing the polymeric residue comprises subjecting the semiconductor wafer to a mixture of at least 50% hydrogen, and approximately 2-20% oxygen and approximately 2-6% fluorine.

20. The method of claim 2 wherein the step of removing the polymeric residue comprises subjecting the semiconductor wafer to a mixture of approximately 80% NH_3, approximately 10-15% N_2, approximately 2-7% O_2, and approximately 2-6% CF_4.

21. The method of claim 1 wherein the hydrogen is provided from a hydrogen source selected from a group consisting of H_2, NH_3, N_2H_2, H_2S, and CH_4.

22. The method of claim 1:

wherein the gas comprises a mixture of gases; and

wherein the mixture includes at least 50% hydrogen.

23. The method of claim 22 wherein the mixture of gases further includes a diluent.

24. The method of claim 23 wherein the diluent is selected from a group consisting of nitrogen, argon, helium, neon, and xenon.

25. The method of claim 23:
wherein the diluent comprises nitrogen; and
wherein the mixture comprises 20% or less of the nitrogen.

26. The method of claim 1:
wherein the gas comprises a mixture of gases; and
wherein the mixture includes approximately 80% NH_3 and 20% N_2.

27. The method of claim 1 wherein the first material comprises a carbon-containing oxide.

28. The method of claim 1 wherein the first material comprises fluorinated silicon glass.

29. The method of claim 1 wherein the first material has a dielectric constant less than 2.8.

30. A method of fabricating an electronic device formed on a semiconductor wafer, comprising the steps of:

forming a layer of a first material in a fixed position relative to the wafer, wherein the first material is reactive with oxygen plasma;

forming a photoresist layer in a fixed position relative to the layer of the first material;

forming at least one void through the layer of the first material in response to the photoresist layer, wherein the step of forming at least one void further forms a polymeric residue in response to the photoresist layer;

subjecting the semiconductor wafer to a plasma which incorporates a gas which includes hydrogen so as to remove the photoresist layer; and

removing the polymeric residue by subjecting the semiconductor wafer to a wet etch chemistry.

31. The method of claim 30 wherein the step of removing the polymeric residue comprises subjecting the semiconductor wafer to a combination of dilute hydrofluoric acid and an organic acid.

32 The method of claim 31 wherein the organic acid comprises dilute citric acid.

33. The method of claim 31 wherein the organic acid comprises dilute acetic acid.

34. The method of claim 31 wherein the organic acid comprises dilute oxalic acid.

35. The method of claim 30 wherein the hydrogen is provided from a hydrogen source selected from a group consisting of H_2, NH_3, N_2H_2, H_2S, and CH_4.

36. The method of claim 30:

wherein the gas comprises a mixture of gases; and

wherein the mixture includes at least 50% hydrogen.

37. The method of claim 36 wherein the mixture of gases further includes a diluent.

38. The method of claim 37 wherein the diluent is selected from a group consisting of nitrogen, argon, helium, neon, and xenon.

39. The method of claim 37:

wherein the diluent comprises nitrogen; and

wherein the mixture comprises 20% or less of the nitrogen.

40. A method of fabricating an electronic device formed on a semiconductor wafer, comprising the steps of:

forming a layer of a first material in a fixed position relative to the wafer, wherein the first material is reactive with oxygen plasma;

forming a photoresist layer in a fixed position relative to the layer of the first material;

forming at least one void through the layer of the first material in response to the photoresist layer, wherein the step of forming at least one void further forms a polymeric residue in response to the photoresist layer;

subjecting the semiconductor wafer to a plasma which incorporates a gas which includes hydrogen so as to remove the photoresist layer; and

removing the polymeric residue by subjecting the semiconductor wafer to a dry plasma.

41. The method of claim 40 wherein the step of removing the polymeric residue comprises subjecting the semiconductor wafer to a mixture of hydrogen, oxygen, and fluorine.

42. The method of claim 41:

wherein the hydrogen in the mixture is provided from a hydrogen source selected from a group consisting of H_2, NH_3, N_2H_2, H_2S, and CH_4; and

wherein the fluorine in the mixture is provided from a fluorine source selected from a group consisting of CF_4, C_2F_6, CHF_3, CH_2F_2, SF_6, CH_3F, and NF_3.

43. The method of claim 41 wherein the mixture further comprises an inert gas.

44. The method of claim 43 wherein the inert gas is selected from a group consisting of nitrogen, argon, xenon, helium, and neon.

45. The method of claim 40 wherein the step of removing the polymeric residue comprises subjecting the semiconductor wafer to a mixture of at least 50% hydrogen, and approximately 2-20% oxygen and approximately 2-6% fluorine.

46. The method of claim 40 wherein the step of removing the polymeric residue comprises subjecting the semiconductor wafer to a mixture of approximately 80% NH_3, approximately 10-15% N_2, approximately 2-7% O_2, and approximately 2-6% CF_4.

47. The method of claim 40:
wherein the gas comprises a mixture of gases; and
wherein the mixture includes at least 50% hydrogen.

48. The method of claim 47 wherein the mixture of gases further includes a diluent.

49. The method of claim 48 wherein the diluent is selected from a group consisting of nitrogen, argon, helium, neon, and xenon.

50. The method of claim 48:
wherein the diluent comprises nitrogen; and
wherein the mixture comprises 20% or less of the nitrogen.

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